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The longevity of the Royal Family

A tale of two dynasties



Note on the author

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Executive summary

In February 2022, the UK will celebrate the Queen's Platinum Jubilee, marking the 70th anniversary of her accession to the throne and becoming Head of the Commonwealth. Born in 1926, the Queen has dutifully served as our monarch and Head of State since 1952. The length of her reign is unmatched in the modern era, being even longer than that of Queen Victoria, her great-grandmother. She has reigned through countless periods of celebration and crisis, and worked with 15 prime ministers.

As we write this report, the Queen is in her 96th year: we estimate that only 0.15% of the UK population are older (approximately 100,000 people). For around 85% of the UK population, she's the only Head of State they have ever known. Around 6 million people alive today should have memories of the coronation, whether as direct spectators or having seen it broadcast live on television or in cinemas.

During the period covered by our study, there have been many changes. In 1952, the UK population was almost entirely white; today around 15% are Black, Asian, or from other ethnic minorities. During this period, the country has also transformed from being virtually of one single faith to having all religions represented in society. But the Queen is still also Supreme Governor of the Church of England.

A tale of two dynasties

In this research, we compare the longevity of the Queen and her bloodline with that of another preeminent family of the twentieth century. The Kennedys are sometimes feted as 'US royalty'. We compare the constitutional positions of these dynasties in the UK and the US, and examine their influences on the development of both countries for over a century.

We find two powerful dynasties which are effectively polar opposites. We look at their positions of privilege, the pressures of elected office versus being born into a hereditary monarchy, the tension between tradition and celebrity, and the role played by wealth in their development and success. We ask whether these different backgrounds are reflected in the lives and careers of their members.

In our comparison of these two dynasties, we centre on a 'focal woman' for each, looking up and down her direct bloodline to her predecessors and antecedents. For the Royal Family, this is of course

the Queen, born in 1926 and still heading her family to this day. For the Kennedys, it's Rose, who was born in 1890 and died aged 104 in 1995.

What we found

We found that the Royal Family enjoys greater longevity than either the general public or the Kennedys. Someone born into the Royal Family could expect to live 26% longer than someone in the general public based on our longevity index. However, we also see that the gap is closing pointing to improvements in population health and we would expect this trend to continue.

When we compare the longevity of the Kennedy family we initially see a similar pattern - unsurprising given their comparative wealth and privilege. But over the last 75 years we see this trend reversing, with Kennedys living shorter lives than the general public, suggesting there are other factors at play. In this period, there were a series of unrelated premature deaths - the so-called 'Kennedy curse'. But is this solely down to bad luck or are there other factors underpinning the differences between these two dynasties?

We make some further intriguing comparisons, for instance between the Queen's role as Supreme Governor of the Church of England and Rose Kennedy's devout Catholic beliefs, the Queen's sense of public duty versus the Kennedys' political engagement, and the two women's roles as mothers of large families. We investigate these differences through the lens of the family histories of their children and grandchildren, and their impact on public life and society in general. We support these with detailed demographic and genealogical analyses of both families and a synopsis of their lives and devotion to public duty.

Starting with the grandparents of the Queen and Rose Kennedy, we introduce each generation in turn. For the Queen, we close with her first great-grandchildren; for Rose Kennedy, with her great-great-grandchildren. We draw attention to the huge inequalities in longevity when comparing the influential and wealthy with the poor: for example, in 1880, 25% of the population of England and Wales would be expected to die before they reached the age of five. This was related to high rates of slum dwelling, poor sanitation and prevalence of childhood disease.

At the heart of this study is a comparison of two dynasties originally established by men but dominated by women who outlived the men

in their families. Their overlapping longevity has allowed them to live through and influence an extraordinary period of world history and change – a feat unlikely to be repeated by future matriarchs.

Introduction

ILC was founded to investigate longevity and the consequences of living in an ageing world, both for society as a whole and the individuals within it. We have mostly addressed topics with obvious connections to this subject, like health and social care, and pensions. These papers generally study individuals by age group rather than by their individual interests or occupations. Recently we have branched out into more tangential topics, such as investigating whether sporting success relates to increased longevity – and these principles can be applied to many other subjects.

In that vein, this research examines whether members of the UK Royal Family enjoy increased longevity compared to the general public, as well as their impact on public life and society in general. We also compare their lives and circumstances to those of another notable family, the Kennedys – who have often been feted as 'US royalty'. The aim is to compare their lives. We also look at the differences arising from their roles: one family within a constitutional monarchy and the other being political figures in a republic where the president has huge executive powers.

Members of both families share a commitment to public duty and service, but they have very different private lives. Other contrasting qualities include: privilege versus power; the political pressures of elected office versus those of hereditary, life-long roles; the tension between tradition and celebrity; and the ability of family members to carve out a private life away from the public gaze. We investigate whether members of these families live longer or shorter lives than the general public, and whether they seem to be at a greater or lower risk of an early death.

Our key finding is that the Royal Family enjoys greater longevity than either the general public or the Kennedy family.

Defining longevity, what we include in our dynasties, and our period of study

We're interested in the longevity of both families. We aim to show whether longevity among both is greater or less than for the average person and if we can point to reasons for those differences.

Because life expectancy has increased so much over the last 100 years, we need to define both longevity and our 'dynasty' for the

purposes of our study. To compare differences in family size and longevity we need clear definitions of who to include or exclude, along with the start and end points of our interest. Our approach is to centre our analysis on the lives, ancestors and descendants of two pivotal figures in these families.

Our research covers the life and times of Elizabeth II, Queen of the United Kingdom of Great Britain and Northern Ireland, Head of the Commonwealth, and Defender of the Faith. Born in 1926, the Queen has served as monarch since 1952. Her family name is Windsor; this was changed in 1917, making her grandfather King George V the first Windsor monarch, which is where our dynasty starts. The equivalent pivotal figure in the Kennedy dynasty is matriarch Rose Kennedy, born in 1890, who died aged 104 in 1995.

Comparing the Windsors with the Kennedys

There are many interesting parallels between the Royal Family and the Kennedys, not least the affection in which they are both held. Much like the Queen and her predecessors, the Kennedy name is remembered around the world on plaques, bridges, squares, streets and buildings, named after US President John F. Kennedy.

The differences between our dynasties make for some intriguing contrasts. For example, the ages to which they live versus that of the general population, privilege versus power, old money versus new, the protestant roots of the Anglican tradition versus Catholicism, public duty versus politics, work versus motherhood, and so on. Whereas the Queen only has ceremonial and constitutional duties, the US presidency bestows supreme power, such as the ability to launch a nuclear war.

Circumstances of royalty

As we write this report, the Queen is in her 96th year: we estimate that only 0.15% of the UK population are older (approximately 100,000 people). For around 86% of the UK population, she's the only Head of State they have ever known. Around 6 million people alive today should have memories of the coronation, whether as direct spectators or having seen it live on television or in cinemas.

Her reign has seen 15 prime ministers, the first being Winston Churchill, although there have been 21 during her lifetime. She has lived through countless crises: political, economic, and armed conflicts. Her service is unmatched in the modern era, as the longest-living leader in the world.

Her reign has lasted longer than that of Queen Victoria, her great-grandmother.

Around the world, ships, schools, hospitals, sporting events and awards, monuments and sculptures all bear her name – even a mountain range. Postage stamps bear her image. Her presence is such a common part of normal life that we take it for granted. We will celebrate her Platinum Jubilee in February 2022, marking the 70th anniversary of her accession to the throne, with many celebrations planned for later in the year, including a national holiday.

The UK monarchy is an unelected institution which follows strict rules of succession. The *Succession to the Crown Act (2013)* ended the system by which a younger son could displace an older daughter in the line of succession, as well as the provisions by which those who marry Roman Catholics were disqualified from succession.

The family members currently in line of succession are Prince Charles, aged 73, and his son Prince William, aged 39. The Act means that Princess Charlotte, William's six-year-old daughter, will be fourth in line, rather than her younger brother Louis. These are significant changes which will steer the monarchy for the next century and more.

Longevity might be associated with royalty: in 2021, the Queen's husband Prince Phillip died just 62 days short of his hundredth birthday, while her mother died aged 101, in 2002. But her predecessors haven't been as long-lived. We investigate whether privilege and devotion to duty are linked to a longer life, and whether this increased longevity might be key to the survival of the monarchy as an institution. But nothing is guaranteed; we recall that monarchy was abolished between 1649 and 1660 following a constitutional row between the monarchy and Parliament.

Circumstances of elected office

In contrast to the Windsors, the Kennedy clan's continued prominence depends on electoral success and access to high positions in public office. John F. Kennedy rose to global eminence when he faced down the Soviet Union during the Cuban missile crisis, avoiding nuclear war, and committed the nation to landing a man on the Moon by the end of the 1960s.

But it's arguable that the Kennedys were only enshrined in the hearts of the public after the assassinations of first John and then Bobby by

gunmen. John served only part of his first term as US president before his death in 1963, while Robert died on the presidential campaign trail in 1968.

While deaths of this nature would be far less likely in the UK due to our gun controls, the Queen has also been subject to assassination attempts. One took place in London at Trooping of the Colour 1981, when a teenager fired six blank shots at her, and another in New Zealand in the same year.

Comparing wealth

Wealth has an obvious link to longevity. Both dynasties are wealthy, but the reality of whether this has enhanced their longevity is complicated. In addition, we can see a clear contrast between 'old' and 'new' money with these two families.

In 1760, George III reached an agreement with the Government in which Crown property would be managed on behalf of the Government, with surplus revenue going to the Treasury. In return, the King would receive a fixed annual payment: the Civil List. In 2012, this agreement was superseded by the Sovereign Grant, which is used to maintain the palaces, pay employees, and support the royal family. The Queen isn't taxed on this income but does pay taxes on her private income (known as the Privy Purse) generated from the Duchy of Lancaster, as well as on her personal investments.

The monarch generally holds the palaces, royal art collections and other artefacts in trust rather than owning them personally. The Queen owns Sandringham House and Balmoral Castle, where she spends a great deal of time. Assets such as these cannot be disposed of, exported or used to fund more eccentric activities like space exploration!

In contrast, the Kennedy family's wealth derives from the highly successful but sometimes dubious business activities and political influence of Rose's husband, Joseph P. Kennedy. In addition to its protection from inheritance tax via the creation of trusts, their wealth continues to grow through new blood and new money introduced through marriage.

Comparing matriarchs

The Queen was educated by tutors and didn't attend university. Rose was convent-educated in the Netherlands, before returning

to the US where she served as her father's companion – she didn't go to college either. During the war, the Queen joined the Women's Auxiliary Territory Service, which brought her into contact with 'ordinary people'. Although Rose did not have a career herself in the conventional sense, she was fiercely ambitious, competitive and helped her children to achieve career success, especially in politics.

Rose's Catholic faith was a significant part of her life; she brought up her nine children to be devout Catholics, met the Pope and was even given the title of 'Countess' for services to Catholicism. The Queen's ambitions were ultimately constrained by her duties and the protocols of the Royal family and as Head of the Church of England. She had a much less 'hands on' role in bringing up her children than Rose; they were sent to educational institutions. Their daily routines couldn't have been more different.

The Queen never gives interviews or expresses opinions. She never comments on public matters or gets involved in any way with politics, any of which would compromise her impartiality. She intends to rule to the end and is reputed to have said that only a stroke or Alzheimer's disease would change that view. If that did happen, Prince Charles would become Prince Regent until her death. There is no biography of the Queen and one won't be written until after she has died.

Rose Kennedy was very different. She loved being in the headlines and frequently gave interviews. She supported her children in whatever way she could, for example helping her sons to campaign. After the deaths of her husband and four of her children, she published her memoir, *Times to Remember*, in 1974. As her official biographer Barbara Perry wrote in 2013, she loved the spotlight and was highly skilled on the campaign trail. Currently there's no obvious candidate to take over her dynastic role – nor is there another obvious presidential candidate.

Weakened by a stroke in 1984, Rose Kennedy spent the last decade of her life at the family home in Hyannis Port, Massachusetts. She died due to complications of pneumonia on 22 January 1995. Events that unfolded after her death included the untimely deaths of five more family members, aged between 8 and 51. The Queen has faced similar situations in her early years such as the death of her father and later the deaths of her sister and mother in 2002. Probably the most difficult from a public viewpoint was her daughter-in-law Diana's death due to the publicity and criticism it raised.

1. Measuring longevity and defining our dynasties

To get us started, we need clear definitions explaining who to include and how far back in time we should go, and also how to measure longevity itself and what we mean by 'family' and our 'dynasty'.

1.1: Life expectancy over time – and survivorship

We know that longevity has been increasing for decades across society; this means that your life expectancy is affected by when you were born. For example, in 1880 around 25% of the population in England and Wales would have died before reaching the age of five, due to poor living conditions (there are no comparable data for the US at this time).

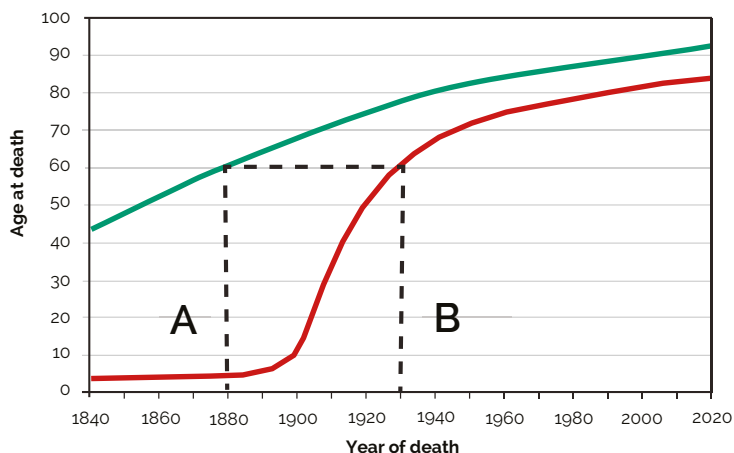
After 1900, living conditions improved quickly due to slum clearance and improved sanitation as well as the introduction of immunisation. The elimination of childhood mortality is considered one of the greatest achievements of the twentieth century – but note that there are still stark inequalities in adult life expectancy in the poorest strata of society to this day.

If someone who was born in 1880 died at 60, they might have been considered old. But if someone born in 1930 died at 60, it might be thought an early death. So we need to ensure we're comparing like with like. To this end, we use cohort life tables, which are based on the probability of death by year of birth.

We need to standardise how we define longevity for all the subjects in our study, by controlling for their year of birth. We can compare the longevity of deceased subjects with the percentage of deaths in the equivalent section of the general population – those born in the same year and who are of the same sex.

Figure 1 shows two individuals: A, born in 1880, and B, born in 1930. Both die at 60, as indicated by the vertical and horizontal hatched lines.

Figure 1: Comparing the longevity of individuals with the general population of England and Wales



Key: The green line is the 50% percentile or median age of death; the red line is the 25th percentile

For A, dying at 60 would have been considered 'normal', since 50% of the population born in 1880 would have died by that age (shown by the green line, which is the median age of death across the population). For B, 60 would have been considered a relatively early age to die, since only 25% of the population born in 1930 would have died by that age (shown by the red line). Any percentile higher than 50 means that longevity is greater than the median, any lower than 50 is less than the median. We give A a 'longevity score' of 50, and B a score of 25. We call this the 'percentile age of death', using it to compare longevity among all the deceased individuals in our dataset.

Extending this to other percentiles (including 10, 25, 50, 75, 95, 99) means we can easily pick out anyone who lived a comparatively long or short life by plotting their age of death against their birth year. We can make comparisons for anyone born since 1841 (when records began) to now. Since the near elimination of childhood mortality in the 1930s, we find that the percentiles tend to converge over time, indicating that life expectancy has been becoming more equal across society.

We examine whether these improvements apply equally to all the individuals in our dataset; the extent to which they have kept pace with the median or average lifespan or exceeded it; and if they haven't, why.

Another important factor is that women generally outlive men – although this is changing, as men’s longevity gradually catches up with women. This means that we treat men and women separately when assigning longevity percentiles, making the results gender-specific.

Survivorship

This view of longevity is based on mortality – completed lives. But survival is a random process; we need to determine whether the number surviving at any given point in time is exceptional.

Our study looks at surviving family members as well as those who’ve died – if we didn’t, we would be excluding many who are in their 70s or older. To address this, we compare the numbers of living subjects in any given year with the number we would expect to be alive based on the life tables for their year of birth. We then sum the probability of being alive over all birth years and express it as an index. If the index is greater than 1, more are alive than would be expected. If it’s less than 1, fewer are alive.

What do we expect to see? The fact that the general population’s mortality rate was much higher in the nineteenth century means that we would expect those with more privileged lives to be shielded from diseases and causes of death that were commonplace in the rest of society. In 1841, female life expectancy was over seven years higher at age 8 (50.9 years) than it was at birth (43.8 years). Today life expectancy at birth is higher than at any other age, thanks to the fall in child and infant mortality. We would expect the life expectancy at birth for a member of the Royal Family or any family of wealth born in 1841 to be much higher – indeed, this is what the data show.

There are no complete data for the US until 1930, but it’s clear that survivorship is also markedly higher for members of the Kennedy family at that time. In the absence of better data we use the same life tables, for the general populace in England and Wales, for comparison to both the Kennedys and the Windsors.

We also find that the probability of a member of the Kennedy family being alive was generally greater than one, compared with the general population. The advantage of a wealthy upbringing has ensured that the Kennedys continued to outstrip the general population for some decades. The index peaked in the 1920s and 1930s, before falling back to a value much closer to one – equality with the rest of the population. And after 1960 it dipped below one, where it currently remains.

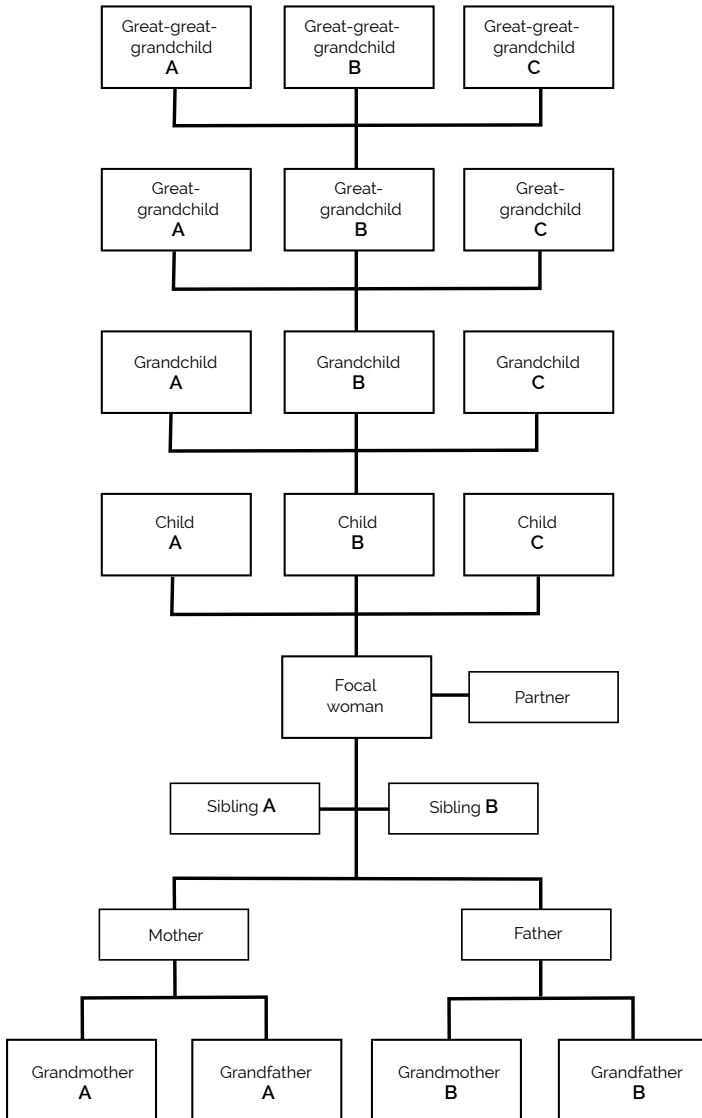
1.2: Defining our dynasties

Studies of historical dynasties often focus on powerful individuals: usually, but not always men. We take a different approach. Women live longer than men on average, and the longer they live, generally the larger the family. We centre our studies on the bloodlines of two focal women – following their surviving children as they produce their own offspring. We use this as a point of reference for analysing family structures with members born before and after our focal women.

We include the focal woman's partner or husband and her siblings. We also include her parents and maternal and paternal grandparents. Only blood descendants count towards the analysis of longevity. We acknowledge but exclude partners, husbands and wives of the focal woman's descendants but they're included in our data as part of the historical record, and we may mention them when relevant to our story. Going forward, we include all the generations born up to and including 2021.

Figure 2 shows the focal woman, her siblings and partner. The two generations below are her parents and grandparents, and the generations above are her children, grandchildren, great-grandchildren and great-great-grandchildren. Apart from her partner, all family members are biologically related to our focal woman, either as parents or grandparents, siblings, children, grandchildren or great-grandchildren.

Figure 2: Defining 'the family' around a focal woman



This is an example of a 'kinship' approach, in which the family is traced through the female rather than male lineage. The family members, along with their biological relationship to the focal woman, are technically referred to as the family pool – but we call this our dynasty.

Table 1 shows our dataset, based on the schema in Figure 2 and our selection criteria.

Table 1: Size of families by generation in 2021 (excludes still births)

Relation	Queen Elizabeth (b. 1926)	Rose Kennedy (1890 - 1995)
Parents and grandparents	8	8
Siblings	1	5
Children	4	9
Grand children	8	30
Great grandchildren	12	75
Great-great-grandchildren	0	16
Total	33	143

Deceased	8	30
Alive in 2021	25	113

The Royal Family has 33 members and the Kennedy family has 143. The difference in the sizes of their family pools is not only because the Kennedys have far more children in each generation, but also because their dynasty started earlier (the Royal Family doesn't yet include great-great-grandchildren of the Queen).

2. The Royal Family

The royal family can be split into two halves. First, there is the Queen herself, and her children, grandchildren and great-grandchildren. The other half falls outside our dynastic definition: those descended from the Queen's grandfather, George V (1865 – 1936). This includes figures like the Duke of Gloucester and Prince Michael of Kent.

Our dynasty

Queen Elizabeth II's parents were the future King George VI (1895 – 1952) and his wife Elizabeth Bowes-Lyon (1900 – 2002). The Queen's paternal grandparents were George V (1865 – 1936) and Mary of Teck (1867 – 1953); her maternal grandparents were Claude Bowes Lyon (1855 – 1944) and Cecelia Cavendish Bentinck (1862-1938). She married Philip Mountbatten (1921 – 2021) in 1947; he then received the titles of Duke of Edinburgh, Earl of Merioneth and Baron Greenwich. When her father died of lung cancer in 1952, she acceded to the throne in the same year and was crowned in 1953. She exceeded Queen Victoria's reign of 63 years in 2016.

Her mother, Queen Elizabeth the Queen Mother, died in 2002 aged 101. Her younger sibling, Princess Margaret, died in 2002 aged 71. Her husband Prince Philip the Duke of Edinburgh died in 2021, three months short of his 100th birthday.

She has four children: Charles, Prince of Wales (b. 1948), Princess Anne (b. 1950), Prince Andrew (b. 1960) and Prince Edward (b. 1964). The first in line to the throne, Prince Charles, aged 73, looks set to be a transitional monarch, while his son William could be over 50 before he becomes king.

Scanning the longevity of her parents and grandparents, including Edward, George V and George VI, it's fairly clear that the longest lived royals were not necessarily descended from Queen Victoria. For example, the Queen Mother outlived George VI by 50 years.

The Queen's children have established public personas with honorary titles and long records of public engagement. For example, Charles founded the Prince's Trust, which helps disadvantaged young people. Princess Anne founded The Princess Royal Trust for Carers. Prince Philip founded the Duke of Edinburgh Award, which has helped over 5 million children.

The private lives of the Queen's children have always been subject to media scrutiny. Prince Charles was ridiculed for championing green issues and climate causes long before they became fashionable. Princess Diana, his former wife, and mother of Princes William and Harry, died in a tragic car accident in 1997; in 2005, Charles married Camilla Parker Bowles. Princess Anne, who has been twice married, with two children from her first marriage, survived a kidnap attempt in 1974. A successful equestrian, she competed in the 1976 Olympics. Prince Andrew, also divorced, who stepped down from his royal duties in 2020, also has two children. Prince Edward had a career in television and theatre production before becoming a full-time royal family member; he has two children too.

According to our definition, the family includes eight grandchildren: four boys and four girls. We can also count 12 great-grandchildren as of December 2021, giving a total of 25 living royals.

Prince William (b. 1982), second in line to the throne, is married to Kate Middleton; they have received the titles of Duke and Duchess of Cambridge. They have three children: Princes George and Louis, and Princess Charlotte. William's brother Harry spent time in the military and saw service in Afghanistan, as did Andrew in the Falklands. Harry married US actor Meghan Markle in 2018 and has since settled in the United States and has two children. Zara Philips, daughter of Princess Anne and Mark Phillips, is a successful equestrian like her mother. Beatrice and Eugenie, daughters of Andrew, are working royals; Beatrice has one daughter, Sienna.

As the Royal Family has grown in size, there are younger family members in the line of succession. Princess Anne, third in line of succession at the time of her birth, drops to 17th in the current ranking. The *Succession to the Crown Act (2013)*, which ended the precedence of male heirs over female, applies going forward, but isn't applied retroactively to her case. Under the new rules, Princess Charlotte (b. 2015), William's second child, is now 4th in line, taking precedence over Prince Louis (b. 2018). These changes guarantee a long line of young successors available to step up to the plate if necessary.

Public duties

The Queen plays a constitutional role in opening and dissolving Parliament and approving bills before they become law. She undertakes various official ceremonial, diplomatic and

representational duties and bestows a range of civil and military honours. She also approves Orders and Proclamations through the Privy Council (which advises the Queen on carrying out her duties), including exercise of the Royal Prerogative and other functions assigned to the Sovereign by Acts of Parliament. Royal assent is the final step required for a parliamentary bill to become law.

The monarch is constitutionally empowered to exercise the Royal Prerogative against the advice of the Prime Minister or the Cabinet, but in practice would only do so in emergencies or where existing precedent doesn't adequately apply to the circumstances in question. In practice, it is effectively a vehicle for executive decisions made by the Government which are then formally issued in the Queen's name. The Queen has a special relationship with the Prime Minister, retaining the right to appoint them, and also meeting with them on a regular basis.

Theoretically she may choose a new prime minister from a shortlist provided by the ruling Government, although this isn't a role she particularly wants. Instead, these decisions are generally taken internally by the ruling party (or parties in the case of a hung parliament). She can refuse permission for dissolution of parliament or refuse to sign legislation, but no monarch has done this for centuries. Her role has therefore changed; direct power has given way to influence and the right to advise, comment or seek information. It can be argued, however, that her influence has grown in proportion to the length of her reign.

The Queen is also head of the military, holding numerous military ranks. She is Supreme Governor of the Church of England, constitutently linking church and state. She is Head of the Commonwealth of Nations: a voluntary association consisting of 54 sovereign states, most of them former British colonies. Its aim is co-operation within a framework of common values and goals such as the promotion of democracy, human rights, and the rule of law, free trade and world peace.

The Queen's role is very different from that of an elected head of state. She focuses on the central importance of duty and how she's viewed by her subjects. She best described what she stands for in a speech on her 21st birthday in 1947: "I declare before you all that my whole life, whether it be long or short, shall be devoted to your service and the service of our great imperial family to which we all

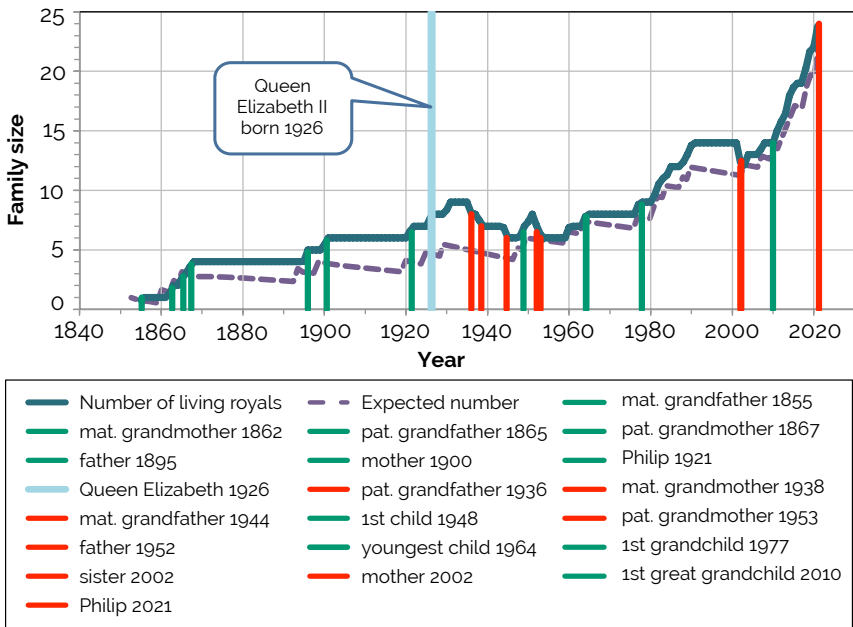
belong." She has stuck faithfully to this promise and refuses to step down as monarch while able.

2.1 Growth and survivorship

Figure 3 shows how the size of this dynasty (as defined for the purposes of our research) has changed over time. Centring on the Queen, we outline the family's size and the size we would expect it to be if mortality had conformed to the rates within the equivalent general population. The first-born according to our definition was the Queen's maternal grandfather in 1855. It shows the timing of all deaths, the timing of the births of the first-born of each new generation, and their relationship to the Queen.

We can see that the Queen became a mother in 1948 with the birth of Charles, a grandmother in 1977 with the birth of Peter Phillips, son of Anne, and a great-grandmother in 2010 with the birth of Savannah, daughter of Peter Phillips.

Figure 3: Size of the Royal Family over time



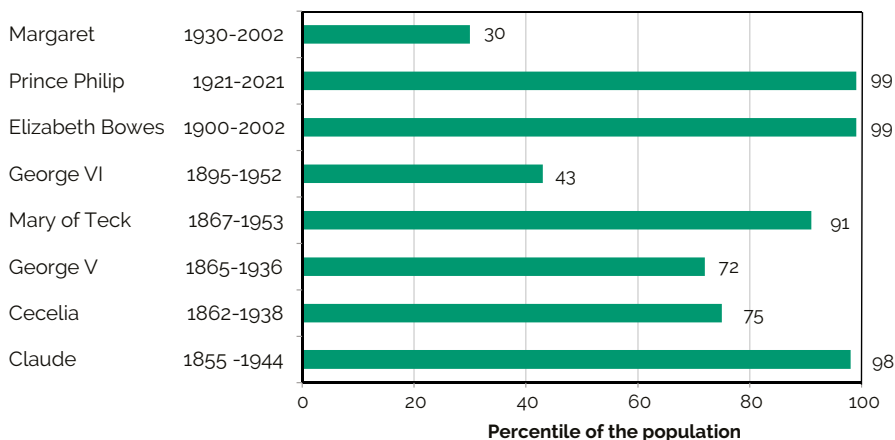
NB: We centre on the Queen, showing years of births and deaths members of her bloodline. The hatched line shows what the expected family size would be if survivorship numbers matched those for the equivalent general population.

(Key: Green = birth; red=death; light blue = birth of Queen)

The hatched line shows that the Royal Family's average longevity is consistently higher than that of the general population. The dynasty is dominated by three long-lived members: the Queen Mother, Prince Philip, and the Queen herself.

We can compare the longevity of deceased members with the percentage of deaths in the equivalent section (by year and sex) of the general population. Figure 4 shows that the percentile longevity scores of six subjects was higher than the median percentile (50%), that of four subjects was higher than the 90th percentile.

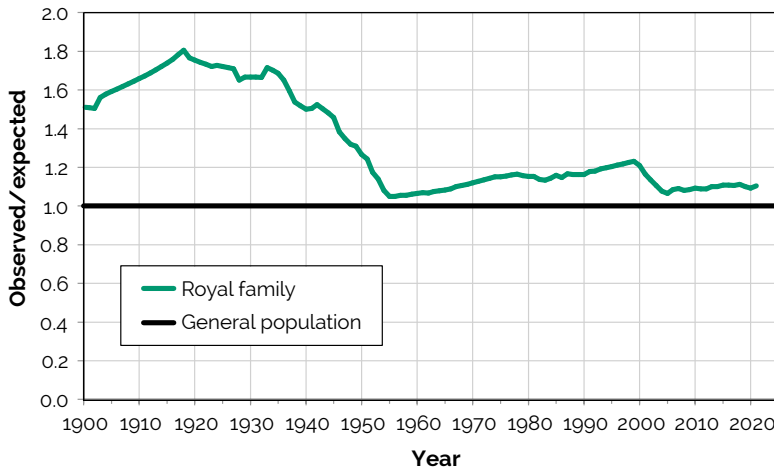
Figure 4: Ages of death with the relevant percentiles of the general population that would have died



The green bars against each name show the percentile age of death in the equivalent section (by year and sex) of the general population. Philip and the Queen Mother reached the 99th percentile, while George VI was in the 43rd and Princess Margaret in the 30th. George VI died at 57, while the median age of death for a man born in 1895 would have been 61. Princess Margaret died age 71, but the median age of death for a woman born in 1930 was 82. The average percentile across all subjects is 76, outliving the median by 26%.

In Figure 5, we test the hypothesis that the Royal Family have outlived the general population based on the ratio of the number alive in any given year to the number we would expect to be alive if they followed the statistics for the general populace.

Figure 5: Observed versus expected number alive, by year, based on a five-year moving average



NB: A value higher than one indicates that the number alive is higher than one would expect to find in the general population according to their year of birth.

As the index is consistently above 1, we can conclude that members of the Royal Family do live longer than the average, but that the degree of advantage has been declining since the 1910s, as general life expectancy has improved. Another reason for this is differences in age structure: for example, if older royals die and younger members are born, this will cause the average family age to fall, bringing it closer to the general public of similar age.

The index remains above 1 to this day, indicating that the Royal Family still has an advantage in longevity. One curiosity is that Margaret died a short while before her mother in 2002, suggesting the events may have been linked, while Mary of Teck (mother of George VI) died in 1953, just a year after his death. Research suggests that the death of a loved one may be linked to one's death; the evidence though, is only circumstantial.

3. The Kennedy family

Our dynasty

Rose Elizabeth Fitzgerald (1890 – 1995), eldest of six children, was daughter to second-generation Irish immigrants John Francis Fitzgerald (1863 – 1950) and Mary Josephine Hannon (1865 – 1964). John was a Democrat who served as mayor of Boston. In 1914, Rose married businessman and investor Joseph P. Kennedy Sr., a leading member of the Democratic Party and the Irish Catholic community. He served as first chairman of the Securities and Exchange Commission (SEC) from 1934 to 1935, and later as US Ambassador to the UK between 1938 and 1940.

In contrast to the Queen, Rose's life was defined by her life as a mother and matriarch, rather than a constitutional figure of authority or a person of elected office. She took prodigious pride in her Roman Catholic roots and her family, to which she was devoted. In 1951 she was ennobled by Pope Pius XII, becoming only the sixth American woman to become a papal countess; she would often sign her name Countess Rose Kennedy. She was also dubbed a political matriarch by her biographer Barbara A. Perry in 2013.

Rose's nine children were Joseph Patrick Jr. (Joe) (1915 – 1944), John Fitzgerald (Jack or JFK) (1917 – 1963), Rose Marie (alternatively Rosemary) (1918 – 2005), Kathleen Agnes (Kick) (1920 – 1948), Eunice Mary (1921 – 2009), Patricia Helen (Pat) (1924 – 2006), Robert Francis (Bobby) (1925 – 1968), Jean Ann (1928 – 2020), and Edward Moore (Ted) (1932 – 2009).

Tragedy first struck the family when Joe Jr. died in action during the Second World War. JFK, elected US President in 1960, was assassinated in 1963 by Lee Harvey Oswald, and presidential candidate Bobby by Sirhan Sirhan in 1968. Her fourth son Ted, a serving Senator, was last of the brothers to die. His political prospects were ruined after a car accident in 1969 in which his young passenger Mary Jo Kopechne died – and for which he was deemed negligent.

Her daughters Rose Marie, Eunice and Patricia all lived into their 80s; the youngest, Jean, lived to see 92. However, Kathleen died aged only 28 in a plane crash. Rose Marie suffered from mental illness. She was given a prefrontal lobotomy when she was 23 and spent the rest of her life in an institution. Apart from Kathleen, their much longer lives are in stark contrast to the shorter lives of Rose's sons.

Apart from Joe and Rose Marie, all of Rose's children had large families, giving her 31 grandchildren: 18 grandsons and 14 granddaughters.

JFK married Jacqueline (Jackie) Lee Bouvier in 1953. After suffering a stillbirth (Arabella) in 1956, Caroline Bouvier, their only surviving child, was born in 1957. John Fitzgerald Jr. followed in 1960. Not a politician, he was probably best known as editor of a magazine called *George* which he co-founded in 1995. He died in a plane crash in 1999 along with his wife and sister in law. Then Patrick was born in 1963, but sadly only lived two days due to birth complications.

Kathleen (Kick) was clearly fascinated by English nobility. She married William Cavendish, Marquess of Hartington and future Duke of Devonshire, who died in action during the Second World War. She was shunned by the family for this marriage as he wasn't a Catholic. She died in a plane crash in 1948, along with her second aristocratic husband, the 8th Earl Fitzwilliam.

Eunice married Sargent Shriver and had five children with him.

Pat married English-born Hollywood actor Peter Lawford and raised four children with him until their marriage ended in 1966 – none of whom went into politics.

Bobby had 11 children with Ethel Skakel: Kathleen (b. 1951), Joseph Patrick Kennedy II (b. 1952), Robert Jr. (b. 1954), David Anthony (1955 – 1984), Courtney (b. 1956), Michael LeMoyne (1958 – 1997), Mary Kerry Kennedy (b. 1959), Christopher George Kennedy (b. 1963), Max (b. 1965), Douglas (b. 1967) and Rory (b. 1968). With the exception of David and Courtney, all Bobby's children had several children each. Courtney married Paul Hill, who was wrongly gaoled for the Guildford IRA bomb attack in 1974. They had one child, Saoirse Roisin, before their marriage ended in 2006.

Jean married businessman Stephen Edward Smith. They had two sons, Stephen Jr. and William, and adopted two daughters, Amanda and Kym. Stephen died in 1990; Jean survived him by 30 years.

Ted married Joan Bennett and had three children: Kara (1960 – 2011), Edward (Ted) Jr. (b. 1961) and Patrick Joseph (b. 1967). Kara was a TV producer who served on the boards of numerous charities; she died of a heart attack aged 51.

We believe that Rose's grandchildren have given her 75 great-grandchildren, the first of which was born 1997, and of whom 44 are great-granddaughters. We think that her great-great-grandchildren currently number 17, with the first arriving in 2012. Far less is publicly known about these generations and some information is quite patchy. Many of the younger ones are still making their way in life and the older ones have a mix of careers such as authors, actors, journalists or models. One with a political pedigree is Rose's great-grandson and Bobby's grandson, Joseph Patrick (Joe) (b. 1980). He served as the US Representative for Massachusetts' 4th congressional district between 2013 and 2021.

Public office

Arguably the main link between the two dynasties share is a commitment to public duty, if not to political office. The most prominent proponents of this commitment within the Kennedy dynasty were of course Rose's most famous sons, but the links with politics and public duty carried on through the female line as well.

The husband of Rose's daughter Eunice, Sargent Shriver, was the 1972 Democrat Vice-Presidential nominee; he worked for the Johnson administration and was prominent in public life for any reasons, including helping to found the Peace Corps. She herself founded the Special Olympics for people with physical and intellectual disabilities. Their youngest daughter, Jean Ann Kennedy, was a diplomat, activist, humanitarian and author who served as US Ambassador to Ireland from 1993 to 1998.

The family tradition of political engagement and public office continued into the next generation.

JFK's daughter Caroline is an author, attorney, and diplomat who served as the US ambassador to Japan from 2013 to 2017. While politically active, she has not achieved elected office, although the Biden administration nominated her as US ambassador to Australia in the summer of 2021.

Eunice's children include: Maria Shriver, who married Arnold Schwarzenegger, Governor of California; Mark Kennedy Shriver, who served on the Maryland House of Delegates for eight years to 2003 and is now President of the Save the Children Action Network; and Robert Shriver, Mayor of Santa Monica, California in 2010.

Kathleen, daughter of Bobby, was Lieutenant Governor of Maryland for eight years to 2003; today she works with the Biden administration on retirement and pension issues. Bobby's son, Joe, was a member of the US House of Representatives for 12 years to 1999, and now works in the renewables sector, using the profits to provide energy savings to low-income families. Another son, Christopher, is also a politician, having been a candidate in the 2018 Democratic primaries for Governor of Illinois. Bobby's daughter, Kerry, is an American lawyer, author and human rights activist. She's president of a non-profit human rights advocacy organization and was married to former New York Governor, Andrew Cuomo, for 15 years – making a political connection through marriage.

Ted's eldest son, Ted Jr., is both a lawyer and a politician who served on Connecticut's state senate for four years to 2019, as well as chairman of the board of directors of the American Association of People with Disabilities. Ted's youngest son, Patrick, was the Rhode Island member of the House of Representatives for many years, as well as a mental health advocate.

The 'Kennedy curse'?

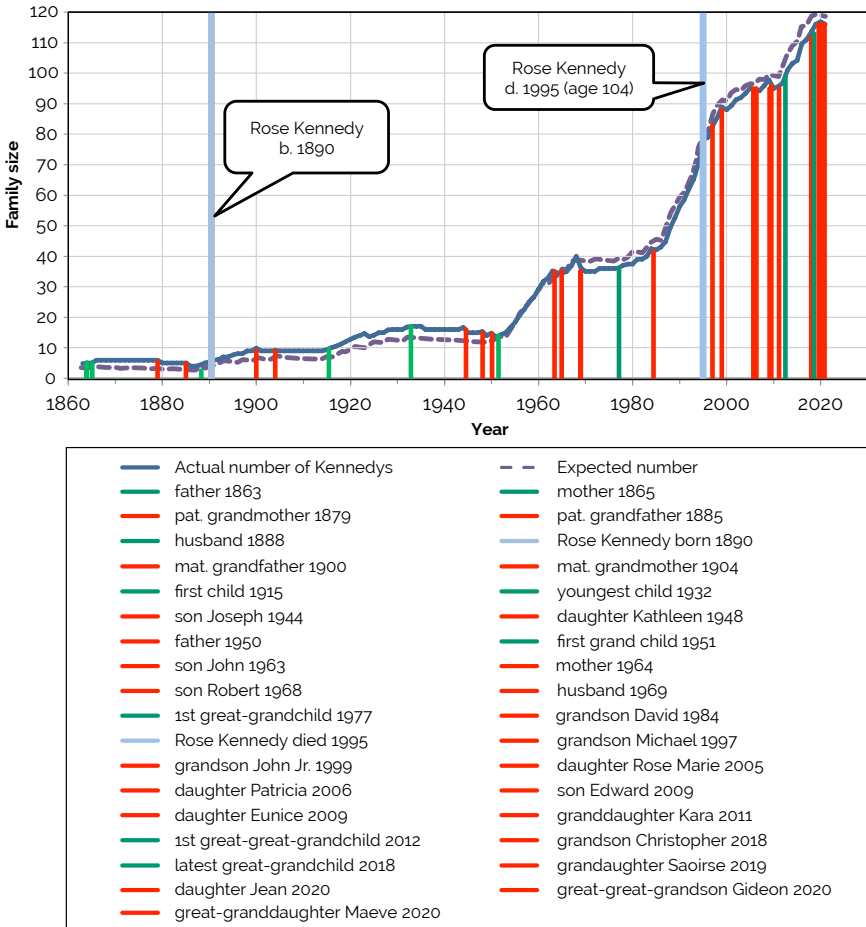
The cluster of premature family deaths that permeated Rose's life, including four of her children, is often referred to as the 'Kennedy curse'. Ordinarily this would have been enough to destroy the will of the average family but somehow it kept going, sustained by achievements of her children especially in politics and public service. Of her 32 grandchildren, 24 were still alive in 2021 but several died in tragic circumstances.

The 'curse' still afflicts Rose's family, long after her death. Of Bobby's children, David died in 1984, also from an overdose, and Michael died in a skiing accident in 1997. Maeve Kennedy McKean (1979 – 2020), great-granddaughter of Rose and Bobby's granddaughter by Kathleen, was an American public health official, human rights attorney and academic, who drowned with her son Gideon in a canoeing accident in 2020. Saoirse, daughter of Bobby's daughter Courtney, died from an overdose in 2019. There were also deaths outside of Rose's bloodline, such as that of Mary Richardson Kennedy, who was married to Robert Jr. (son of Bobby); she committed suicide in 2012.

3.1 Growth and survivorship

Figure 6 shows how the size of the Kennedy dynasty (as defined for the purposes of our research) has changed over time. Centring on Rose, we outline the family's size and the size we would expect it to be if mortality had conformed to the rates within the equivalent general population.

Figure 6: Size of the Kennedy family over time



NB: We centre on Rose Kennedy, showing years of births and deaths for members of her bloodline. The solid line shows the size of the family and the hatched line shows what the expected family size would be if survivorship numbers matched those for the equivalent general population.

Key: Green = birth; red=death; light blue = birth and death of Rose

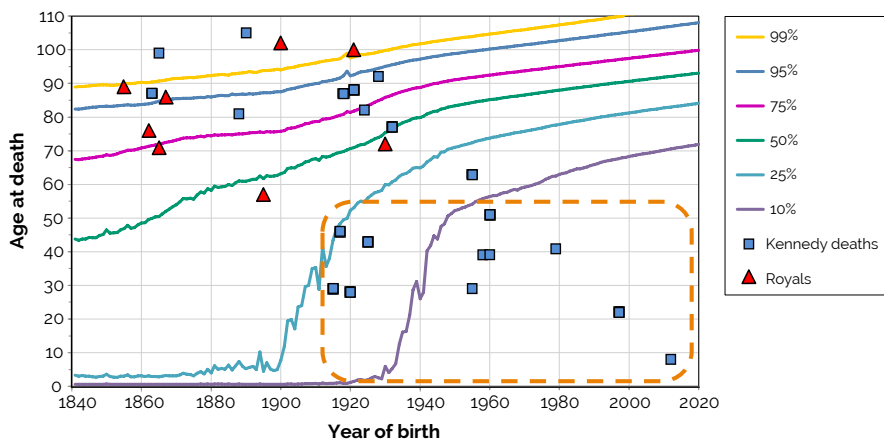
It shows the timing of all deaths, the timing of the births of the first-born of each new generation, and their relationship to Rose. Deaths start with that of Rose's son Joseph in 1944 – those of Rose's siblings and the three neonatal deaths are excluded.

The size of the family increases sharply after 1950; the family pool had 113 living members in 2021. This compares with 78 living members in the year of Rose's death at age 105. This can be compared with the Royal Family, which has only 25 living members, including the Queen and excluding partners, although she's still only in her 96th year.

The hatched line shows that until around 1960, longevity within the Kennedy dynasty was consistently higher than that of the general population. After 1960 there was a reversal – the line representing their actual numbers falls below the hatched line, the exact opposite of what we observed in the Windsor dynasty. This broadly coincides with the 'Kennedy curse' years, when several subjects died prematurely, starting with Rose's son Joseph in 1944. Family longevity tends to be dominated by women, including Rose herself, her mother Mary Josephine Hannon, and her daughters – but not her sons.

Figure 7 puts the longevity of both the dynasties we're studying into wider perspective.

Figure 7: Age at death for members of both dynasties, compared with the general population, by year of birth



NB: Solid lines show the cumulative probability of death for different percentiles of the population according to year of birth. The hatched area encloses data from blood relatives of Rose Kennedy that are referred to as victims of the 'Kennedy curse.' Rose's siblings aren't included in this data.

The blue squares represent deaths within Rose Kennedy's bloodline, while the red triangles represent deaths within the Queen's bloodline. The solid coloured lines show survivorship in the general male population by year of birth, with divisions based on the 10th, 25th, 50th, 75th, 95th and 99th percentiles. The upward slopes reflect general increases in longevity over time, with the inequality gap between upper and lower percentiles narrowing.

What stands out is how precarious early life was in nineteenth-century England and Wales (see Section 1, Figure 1). On average, 25% of each cohort would be expected to die before their 5th birthday. While there were significant improvements in public health between 1900 and 1930, with longevity inequalities narrowing as a result, the Royal Family and the Kennedys were shielded from their effects.

Comparing dynasties, we find that the average percentile for royal deaths is much higher than that for deaths within the Kennedy family (76 versus 39). But if we separate the deaths in the Kennedy family into two groups, we see a different picture. Separating out the deaths often referred to as being part of the 'Kennedy curse' (starting with Rose's son Joseph in 1944 and ending with her great-granddaughter Maeve) the average percentile jumps to 73, just slightly lower than that of the Royal Family. The average percentile for the 'Kennedy curse' deaths is just 9. It's also telling that a large number of deaths were the results of accidents, including three plane crashes, a drowning and two drug overdoses, as well as two murders. This may suggest a pattern of not just bad luck but also risky behaviour.

Their impact is also clearly seen in Figure 8.

The green bars against each name show the percentile age of deaths, compared to the same reference population used for the Royal Family. Any percentile higher than 50 means that this individual's longevity is greater than the median age of death for the general population, any lower than 50 is less than the population median. We include all family members within Rose's bloodline who were born after 1840 (but not her siblings).

Figure 8: Ages at death with the percentiles of the relevant general population that would have died

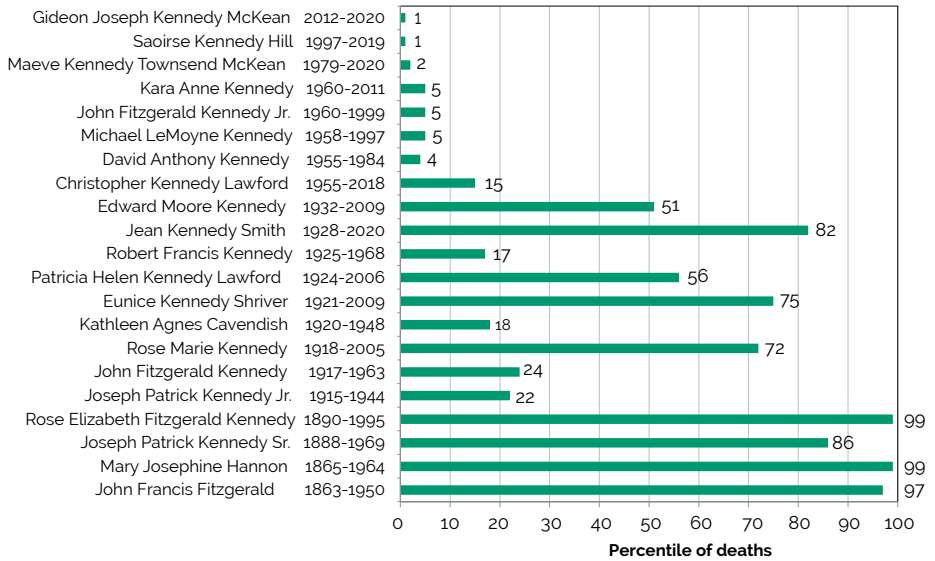
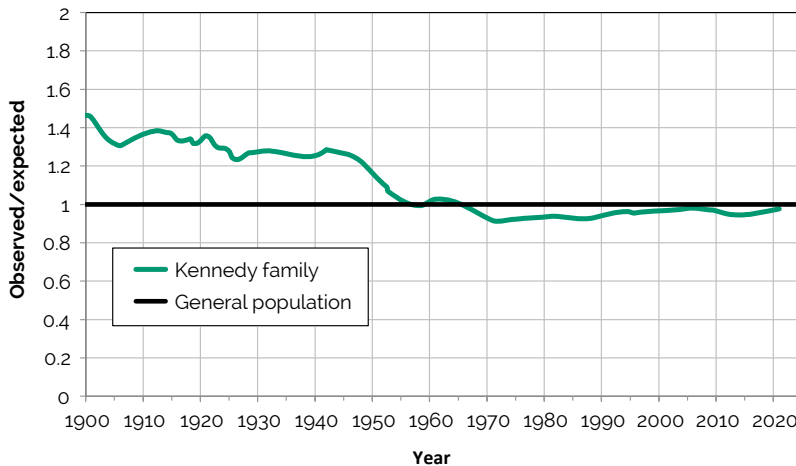


Figure 9 compares the number of living Kennedys with what we would expect to find in the general population, based on year of birth.

Figure 9: Observed versus expected number alive, by year, based on a five-year moving average



NB: A value high than one indicates that the number alive is higher than one would expect to find in the general population according to their year of birth.

This figure includes all members of the Kennedy family, including Roses' five siblings. The equivalent data for the Royal Family (Section 2.1, Figure 5) showed that they enjoyed greater than average longevity over time. In contrast, while the Kennedys also experienced greater than average longevity up to 1955, this then fell to below average. The chart shows evidence of recovery up to the early 2000s due to an expanding family size, but a slight dip between 2010 and 2020 with another spate of deaths.

4. Discussion

On 6 February 2022 many parts of the world will celebrate the 70th anniversary of the Queen's ascent to the throne. She is already the UK's longest-ever reigning monarch, surpassed in Europe only by Louis XIV of France (1638 – 1715), who reigned for 72 years. The Queen has left her mark on many lives and on all areas of the UK. For many of her subjects, she's the only monarch they've ever known, one who has weathered political storms that have raged around her, national crises and family issues, with both dignity and devotion to duty. She's renowned for her Christmas broadcast to the UK and Commonwealth and writes congratulatory messages to her subjects who are celebrating milestones such as turning 100 years of age.

Is the monarchy popular? A UK-wide survey showed that around 62% of respondents supported the monarchy, rising to 84% of those aged over 65, whilst 73% thinks she does a good or fairly good job. This compares with a current approval rating for the UK Government of 26%, having slipped from 50% in April 2020.

The Royal Family has grown in size, with a robust line of succession including younger and older family members. This was not always the case, especially in the early part of her reign when the future of the monarchy was less secure.

There are many ways to compare our two families. In our introduction we drew attention to the differences between a hereditary monarchy and a political dynasty. We chose the Kennedy family as our comparator as the two dynasties share similarities but also have major differences. We know that the Kennedys have been referred to as the US equivalent of the Royal Family. President Kennedy remains the most popular post-war president, which has rubbed off on the rest of the family and consequently has set a very high bar for them to succeed.

Commitment to duty and public service

Both families share a commitment to duty, whether through their hereditary roles or through elected positions. What also draws them tighter is a shared commitment to public service – this is often through the voluntary sector or organisations for which they act as patrons (or in the case of the Kennedy dynasty, where they play an executive role). The Queen was once patron to over 600 organisations, although she has recently been relinquishing many of these responsibilities to other family members.

The Queen's children have more freedom to operate in the public arena than the Queen as long as it is not in areas that would be in conflict with Government policy or would affect the Queen's neutrality.

The cost of constitutional formats

Another contrast is in the costs of the two political systems for their countries. The longevity of any US political dynasty must be reaffirmed regularly at the ballot box. But the US presidency doesn't come cheap. The last election is reputed to have cost \$14 billion, including elections to Congress. By contrast the monarchy costs an estimated £350 million a year, whilst the UK general election in 2017 cost about £140 million (according to the Electoral Commission). Of course the US is by far the bigger country, but any independent observer must be struck by the cost of the US system, even questioning whether it delivers value for money or the best person for the job.

Longevity and survivorship shape dynasties – and vice versa

We're interested in whether our dynasties' constitutional positions in any way shaped these two families' longevity down the generations.

We found marked differences in longevity. The series of tragedies that mark the Kennedy dynasty might be linked sequentially or simply bad luck. JFK and Bobby Kennedy's assassinations aside, all other deaths were accidental: plane crashes, drowning, a skiing accident, overdoses.

It seems unlikely that so many mishaps can be a coincidence. Could it be caused by the massive pressure of expectation and public scrutiny that comes with being a Kennedy? Some factors are likely to be contextual, like the freedom to own and carry guns in the US, but can't be proven definitively.

Our central conclusion is that the Royal Family is longer lived than the general public, which in turn has been longer lived than the Kennedys over the total period of study.

The much larger size of the Kennedy family is partly explained by the fact that Rose was born 36 years before the Queen, but her Catholic faith is also a critical factor, as this often leads to large families. And there's is no exact parallel for the 'Kennedy curse' in the Royal Family. Princes Harry and Andrew served in armed conflicts, being exposed to mortal danger, and Princess Anne was nearly kidnapped with her driver and bodyguard being wounded, but all survived.

But for both dynasties it's also clear that the length of life matters. Neither the Queen nor Rose would have had such commanding influence if their lives had been shorter. Their lives and those of their family members contrast greatly with those of the general public.

Our purpose has been to compare two dynasties, originally established by men but dominated by the women who far outlasted any males before them. Their longevity has allowed them to live through and influence an extraordinary period of world history and change – a feat unlikely to be repeated by future matriarchs.

Does our study also tell us something about what the UK would have looked like if it had been a republic rather than a monarchy? The jury is out, but it's clear that the Kennedy dynasty's political status will need rejuvenating at the ballot box – not something the Queen or the monarchy needs to worry about.

Annex A

1. Extracting age of death for a given percentile of survivors

Our life tables, published by the Office for National Statistics, are based on a single year of age. To compare survivorship based on year of birth, we require the age, x_p , to which a given percentile of the population, l_p , survives. This is given by interpolation as:

$$x_p = \frac{l_x - l_p}{l_x - l_{x+1}} + x \quad l_x > l_p > l_{x+1}$$

Where x is age, l_x is the number surviving to x , and l_{x+1} is the number surviving to age $x + 1$. Rearranging the equation, we can solve for values of p given x , or x given p .

2. Testing whether number alive in year T exceeds expectations

Let the probability of survival to age z for someone born in year t , gender i , be:

$$S^i(z_t, t)$$

If n_t are born in year t then the expected number surviving to age z is $n_t^i S^i(z_t, t)$

Let the years range from t_0 to year T where in our case T ranges from 1900 to 2020.

The total number expected to be alive in year T is:

$$E_T = \sum_{t=t_0}^{t=T} n_t^i S^i(z_t, t)$$

If the total number expected to be alive is A_T then the survival ratio in year T is

$$\frac{E_T}{A_T}$$

An index of 1 or greater means that the number alive is equal to or greater than expected based on general mortality; if it's less than 1, survival is less than expected.

The test used to verify whether the index is significantly different from unity is called the *mid-p exact test* whose calculation can be found at: <https://www.openepi.com/SMR/SMR.htm>. For further information on this test, see: O.S. Miettinen, *American Journal of Epidemiology*, 1974, 99:5, pp 325-332.

About the ILC

The International Longevity Centre UK (ILC) is the UK's specialist think tank on the impact of longevity on society. The ILC was established in 1997, as one of the founder members of the International Longevity Centre Global Alliance, an international network on longevity.

We have unrivalled expertise in demographic change, ageing and longevity. We use this expertise to highlight the impact of ageing on society, working with experts, policy makers and practitioners to provoke conversations and pioneer solutions for a society where everyone can thrive, regardless of age.



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